

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference GAT 001	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/US04/35252	International filing date (day/month/year) 21 October 2004 (21.10.2004)	Priority date (day/month/year) 21 October 2003 (21.10.2003)	
International Patent Classification (IPC) or national classification and IPC IPC(7): H05B 6/70, 6/72 and US Cl.: 219/746, 748, 697			
Applicant GLOBAL APPLIANCE TECHNOLOGIES, INC.			

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. ☒ (sent to the applicant and to the International Bureau) a total of 8 sheets, as follows:

☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒ Box No. I Basis of the report

☐ Box No. II Priority

☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

☐ Box No. IV Lack of unity of invention

☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

☐ Box No. VI Certain documents cited

☐ Box No. VII Certain defects in the international application

☐ Box No. VIII Certain observations on the international application

Date of submission of the demand

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/US04/35252

Box No. I Basis of the report

1. With regard to the language, this report is based on:

- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into English, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
- ☐ publication of the international application (under Rule 12.4(a))
- ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-18 as originally filed/furnished
- pages* NONE received by this Authority on _____
- pages* NONE received by this Authority on _____
- ☒ the claims:
- pages NONE as originally filed/furnished
- pages* NONE as amended (together with any statement) under Article 19
- pages* 20-27 received by this Authority on 14 October 2005 (14.10.2005)
- pages* NONE received by this Authority on _____
- ☒ the drawings:
- pages 1-9 as originally filed/furnished
- pages* NONE received by this Authority on _____
- pages* NONE received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☒ The amendments have resulted in the cancellation of:

- ☒ the description, pages NONE
- ☒ the claims, Nos. NONE
- ☒ the drawings, sheets/figs NONE
- ☒ the sequence listing (*specify*): NONE
- ☒ any table(s) related to the sequence listing (*specify*): NONE

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US04/35252

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims <u>1-31</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>NONE</u>	YES
	Claims <u>1-31</u>	NO
Industrial Applicability (IA)	Claims <u>1-31</u>	YES
	Claims <u>NONE</u>	NO

2. Citations and Explanations (Rule 70.7)

New Citations:

JP 63-317068 A (TOPPAN PRINTING CO LTD) 26 December 1988 (26.12.1988), see Figures 3 and 4 and the English abstract.

US 5,825,000 A (JUN) 20 October 1998 (20.10.1998), see Figures 1 and 2 and col. 1, lines 41-62.

US 4,480,164 A (DILLS) 30 October 1984 (30.10.1984), see Figures 1-4 and col. 2, line 18 - col. 5, line 44.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

V. 2. Citations and Explanations:

Claims 1-4, 22, 26 and 28 lack an inventive step under PCT Article 33(3) as being obvious over BAKANOWSKI et al (US 4,464,554), in view of TOPPAN PRINTING CO LTD (JP 63-317068) or JUN (US 5,825,000). As shown in Figures 2-6 and col. 4, line 46 - col. 8, line 39), BAKANOWSKI et al shows a microwave cooking oven (10) comprising an oven cavity (24), at least one cooking rack (37), a single magnetron (40), two opposing rectangular waveguide chambers (46, 50) each with a plurality of radiating slots of less than half free space wavelength (col. 7, line 58 - col. 8, line 4). It does not show the slot is configured such that a substantially uniform microwave pattern is achieved without using a mechanical phase-altering device as it includes a mechanical device. However, the term "uniform microwave pattern" is highly relative, any microwave pattern in a microwave oven with or without a mechanical phase altering device can be considered as "uniform" to a degree. Anyway, TOPPAN PRINTING CO LTD shows a microwave oven 10 with slot radiator D including a plurality of slots 13. It teaches "uniform irradiation can be carried out even without using a means for rotating the substance" (see Figures 3 and 4 and the English abstract). JUN also shows a microwave oven with radiating slots 232 and 234 for uniform microwave pattern without mechanical phase-altering devices (see Figures 1 and 2 and col. 1, lines 41-62). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify BAKANOWSKI et al to arrange its slots so that a uniform radiating pattern is achieved without a mechanical altering device to lower cost, in view of the teaching of TOPPAN PRINTING CO LTD or JUN.

Claims (29 and 30)/ (1-4, 22, 26, and 28) lack an inventive step under PCT Article 33(3) as being obvious over BAKANOWSKI et al (US 4,464,554), in view of TOPPAN PRINTING CO LTD (JP 63-317068) or JUN (US 5,825,000) as applied to claims 1-4, 22, 26 and 28 above, and further in view of DILLS (US 4,480,164). BAKANOWSKI et al shows every feature as claimed except for the use hot gas in additional to the microwave for heating. DILLS shows a microwave oven with two rectangular waveguides together with hot air circulation from top and bottom of the oven chamber for heating food placed on a rack (see Figures 1-4 and col. 2, line 18 - col. 5, line 44). It would have been obvious to one having ordinary skill in the art at the time of the invention to further modify BAKANOWSKI et al to use hot air circulation for better cooking result, in view of the teaching of DILLS.

Claims 5-16, 23-25 and 31/(1, 22 and 28) lack an inventive step under PCT Article 33(3) as being obvious over BAKANOWSKI et al (US 4,464,554), in view of TOPPAN PRINTING CO LTD (JP 63-317068) or JUN (US 5,825,000) as applied to claims 1-4, 22, 26 and 28 above, and further in view of BLASS et al (US 2,704,802) or SMITH (US 3,210,511). As shown above, BAKANOWSKI et al shows every feature as claimed (see Figures 2-6 and col. 4, line 46 - col. 8, line 39) except for the exact arrangement of the slots. BLASS et al shows a microwave oven having a waveguide 14 with slanted radiating slots 19 (see Figures 1-6 and col. 1, line 80 - col. 3, line 48).

Supplemental Box

SMITH also shows a microwave oven with two rectangular waveguides each with a radiating slot offset from each other (see Figures 1-3 and col. 1, line 47 - col. 2, line 42). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify BAKANOWSKI et al to use slanted slots for more uniform radiating patterns and better cooking result, in view of the teaching of BLASS et al or SMITH. The exact size and pattern of the slots would have been a matter of engineering expediency following the teaching of these references.

Claims (29 and 30)/ (5-16 and 23-25) lack an inventive step under PCT Article 33(3) as being obvious over BAKANOWSKI et al (US 4,464,554), in view of TOPPAN PRINTING CO LTD (JP 63-317068) or JUN (US 5,825,000) with BLASS et al (US 2,704,802) or SMITH (US 3,210,511), as applied to claims 5-16 and 23-25 above, and further in view of DILLS (US 4,480,164). BAKANOWSKI et al shows every feature as claimed except for the use hot gas in addition to the microwave for heating. DILLS shows a microwave oven with two rectangular waveguides together with hot air circulation from top and bottom of the oven chamber for heating food placed on a rack (see Figures 1-4 and col. 2, line 18 - col. 5, line 44). It would have been obvious to one having ordinary skill in the art at the time of the invention to further modify BAKANOWSKI et al to use hot air circulation for better cooking result, in view of the teaching of DILLS.

Claims 17-21, 27 and 31/17 lack an inventive step under PCT Article 33(3) as being obvious over BAKANOWSKI (US 4,464,554), in view of TOPPAN PRINTING CO LTD (JP 63-317068) or JUN (US 5,825,000) as applied to claims 1-4, 22, 26 and 28 above, and further in view of MEREDITH (US 5,369,250). As shown above, BAKANOWSKI et al shows every feature as claimed (see Figures 2-6 and col. 4, line 46 - col. 8, line 39) except for the use of a slot cover for sealing the slots. MEREDITH shows a microwave heating device with a waveguide 6 having slots 7-11 and the slots are covered with a sheet of a dielectric material (see Figures 3-6, col. 2, lines 7-17 and col. 5, lines 12-19). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify BAKANOWSKI et al to use a cover for sealing the radiating slots to prevent contamination of the waveguide and for better impedance matching, in view of the teaching of MEREDITH. The exact material of the cover would have been a matter of mere design variations.

Claims (29 and 30)/ (17-21 and 27) lack an inventive step under PCT Article 33(3) as being obvious over BAKANOWSKI et al (US 4,464,554), in view of TOPPAN PRINTING CO LTD (JP 63-317068) or JUN (US 5,825,000) with MEREDITH (US 5,369,250), as applied to claims 17-21 and 27 above, and further in view of DILLS (US 4,480,164). BAKANOWSKI et al shows every feature as claimed except for the use hot gas in addition to the microwave for heating. DILLS shows a microwave oven with two rectangular waveguides together with hot air circulation from top and bottom of the oven chamber for heating food placed on a rack (see Figures 1-4 and col. 2, line 18 - col. 5, line 44). It would have been obvious to one having ordinary skill in the art at the time of the invention to further modify BAKANOWSKI et al to use hot air circulation for better cooking result, in view of the teaching of DILLS.

Claims 1-31 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

We claim:

1. A speed cooking oven for cooking a food product, comprising:
 - an oven cavity;
 - at least one cooking rack;
 - at least one magnetron for generating microwaves;
 - at least one rectangular waveguide chamber operably associated with the magnetron, the waveguide chamber having a proximal end near the magnetron, an opposing distal end, and a longitudinal chamber axis;
 - at least one slot opening in the waveguide chamber having a center point disposed along the longitudinal chamber axis, the center point being located a selected distance from the distal end of the waveguide chamber, the slot having a slot length along [the] a longitudinal [chamber] slot axis that is less than 0.5 free space wavelength;
 - wherein the at least one slot is configured such that a substantially uniform microwave pattern is achieved without using a mechanical phase-altering device.
2. The speed cooking oven according to claim 1, wherein each slot is defined by a pair of elongated parallel sides connected at each end by semicircular ends, each slot having [a longitudinal slot axis and] a vertical slot axis perpendicular to the longitudinal slot axis, such that the center point is located at the intersection of the longitudinal slot axis and the vertical slot axis.

3. The speed cooking oven according to claim 1, wherein each waveguide chamber includes first, second, and third slot openings.

4. The speed cooking oven according to claim 3, wherein the selected distance of the center point of the first slot opening is 0.5 of the waveguide wavelength.

5. The speed cooking oven according to claim 3, wherein the slot has a width between about 0.25 inches and 0.35 inches.

6. The speed cooking oven according to claim 5, wherein the first slot is inclined relative to the longitudinal chamber axis, such that the end of the first slot closest to the distal end of the waveguide is higher than the other end of the first slot.

7. The speed cooking oven according to claim 6, wherein the angle of incline of the first slot is between about 10 and 45 degrees.

8. The speed cooking oven according to claim 7, wherein the spacing between each slot is along the longitudinal chamber axis 0.5 of the waveguide wavelength.

9. The speed cooking oven according to claim 8, wherein the second slot is oriented at 90 degrees from the first slot.

10. The speed cooking oven according to claim 9, wherein the third slot is oriented at 90 degrees from the second slot.

11. The speed cooking oven according to claim 10, wherein each longitudinal chamber axis is located between about 0.5 and 2.0 inches above each corresponding cooking rack.

12. The speed cooking oven according to claim 1, further comprising:
a means for reducing interference between e-fields emitted through slots of opposing waveguide chambers.

13. The speed cooking oven according to claim 12, wherein the means for reducing interference between e-fields is inwardly canted opposing waveguide chambers.

14. The speed cooking oven according to claim 12, wherein the means for reducing interference between e-fields is vertically offset waveguide chambers.

15. The speed cooking oven according to claim 12, wherein the means for reducing interference between e-fields is slots in opposing waveguide chambers that are offset along the longitudinal chamber axes of the opposing waveguide chambers.

16. The speed cooking oven according to claim 12, wherein the means for reducing interference between e-fields is a control system for selectively adjusting the power outputs of the magnetrons.

17. A speed cooking oven for cooking a food product, comprising:

an oven cavity;

at least one cooking rack;

at least one magnetron for generating microwaves;

at least one rectangular waveguide chamber operably associated with the magnetron, the waveguide chamber having a proximal end near the magnetron, an opposing distal end, and a longitudinal chamber axis;

at least one slot opening in the waveguide chamber having a center point disposed along a longitudinal slot axis, the center point being located a selected distance from the distal end of the waveguide chamber; and

a thin, non-breakable slot cover for sealing the slots;

wherein the at least one slot is configured such that a substantially uniform microwave pattern is achieved without using a mechanical phase-altering device.

18. The speed cooking oven according to claim 17, wherein slot cover is formed from polytetraflouroethylene.

19. The speed cooking oven according to claim 17, wherein slot cover is formed from a fiberglass material.

20. The speed cooking oven according to claim 17, wherein slot cover is formed from mica sheets.

21. The speed cooking oven according to claim 17, wherein slot cover is adhered to the waveguide by a silicone rubber material.

22. A speed cooking oven for cooking a food product, comprising:
an oven cavity;
at least one cooking rack;
at least one magnetron for generating microwaves;
two opposing rectangular waveguides operably associated with the magnetron, each waveguide having a proximal end near the magnetron, an opposing distal end, and a longitudinal chamber axis;
at least one slot opening in each waveguide having a center point disposed along a longitudinal slot axis, the center point being located a selected distance from the distal end of the waveguide;

wherein the at least one slot is configured such that a substantially uniform microwave pattern is achieved without using a mechanical phase-altering device.

23. The speed cooking oven according to claim 22, wherein the opposing waveguides are canted inwardly, so as to reduce interference between e-fields emitted through the slots of the opposing waveguides.

24. The speed cooking oven according to claim 22, wherein the opposing waveguides are vertically offset, so as to reduce interference between e-fields emitted through the slots of the opposing waveguides.

25. The speed cooking oven according to claim 22, wherein the slots in opposing waveguide chambers are offset along the longitudinal chamber axes of the opposing waveguide chambers, so as to reduce interference between e-fields emitted through the slots of the opposing waveguides.

26. The speed cooking oven according to claim 22, further comprising:
a control system for selectively adjusting the power outputs of the magnetrons.

27. The speed cooking oven according to claim 22, further comprising:
a thin, non-breakable slot cover for sealing the slots of each waveguide.

28. A speed cooking oven for cooking a food product, comprising:

an oven cavity;

at least one cooking rack;

a single magnetron for generating microwaves;

at least two rectangular waveguide chambers operably associated with the magnetron, the waveguide chambers having proximal ends near the magnetron, opposing distal ends, and longitudinal chamber axes;

at least one slot opening in each waveguide chamber having a center point disposed along the respective longitudinal chamber axes, the center points being located selected distances from the distal ends of the waveguide chambers, the slots having slot lengths along respective longitudinal slot axes that are less than 0.5 free space wavelength;

wherein the at least one slot is configured such that a substantially uniform microwave pattern is achieved without using a mechanical phase-altering device.

29. A speed cooking oven as set forth in any of Claims 1-28 wherein the oven is operable to use microwave energy and hot gas flow through the oven cavity for cooking the food product.

30. A speed cooking oven as set forth in claim 29 wherein the microwave energy is directed into the oven cavity from opposite sides of the oven cavity, and wherein the hot gas flow is directed into the oven cavity from the same opposite sides of said oven cavity.

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31. The speed cooking oven as set forth in any of claims 1, 17, 22 and 28, wherein the at least one slot opening is inclined relative to the longitudinal axis of the waveguide chamber.

AMENDED SHEET